

COMPLETE SPECIFICATION.

Improvements in Mill Casings.



We, HARTSTOFF-METALL ARTIENGESSELLSCHAFT (HARTSTOFF), a joint Stock Company organised under the Laws of the Republic of Germany, of 39/42, Kaiser Wilhelm Strasse, Berlin-Cöpenick, Germany, and ERWIN KRAMER, a German Subject, of Bayreuther Strasse 26, Berlin, W.30, Germany, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to mill casings and has for one object the provision of a mill casing, particularly intended for high-speed mills such as centrifugal grinding mills and the like, wherein the inner surface is formed of a material which resists wear, such as manganese steel, chilled steel or the like, and which also ensures rapid exchange of heat with the exterior or with a cooling or heating liquid.

It is already known to form the linings of mill casings of hard or wear resisting material, the wall of the casing and lining being separate units.

It is practically impossible, except at very heavy expense, to fit the elements of the lining and the casing of a mill together so as to obtain a perfect contact and thereby eliminate all air spaces. This objection greatly hinders the transfer of heat from the interior to the exterior of the mill casing, so that even water cooling devices flushing the outer surface of the casing have only a very limited effect on the inner surface of the casing.

On the other hand, a double wall makes the mill very heavy and expensive. With a casing constructed in accordance with the invention, however, the construction is such that the outer surface of the parts which form the wear resisting inner lining of the mill are in direct contact with the surrounding medium, air, water, or the like. The heat therefore has to pass only through the thickness of such lining. Air spaces, which disturb the conduction of heat are entirely eliminated. If a very rapid heat conduction is desired, hollow spaces may be provided between the casing and the lining through which

water or other suitable liquids are circulated.

A further advantage of the invention consists in the fact that the casing may be made perfectly dust-tight and even water and gas-tight without the necessity of exactly fitting the hard or wear-resisting sections of the lining. Such a necessity would make the mill unremunerative and in larger sizes would prevent construction.

The obvious means of eliminating leaky joints between the section of a mill casing is to construct the casing of as few sections as possible. If, however, the inner lining comprises a small number of sections, the separate sections are bound to have comparatively large dimensions and complicated shapes impossible of manufacture or which can only be manufactured with difficulty from manganese cast steel or chilled castings. The present invention however departs from this principle.

According to the present invention there is provided a mill casing for centrifugal disintegrating or cyclone mills, an inner lining of which is built up of elements of wear-resisting material, characterised in that the lining is secured to an outer frame or casing in such a manner as to provide for the direct access of a cooling or heating medium to the outer surface of the lining, packing being provided between the lining elements and the outer frame or casing for the purpose specified.

In a suitable construction according to the invention the casing contains a number of frames which are panelled to correspond to the pieces which form the inner lining. Each separate piece of the lining is jointed adjacent to its edges in sealing relationship to the casing, no direct sealing joint thus being necessary between the adjacent edges of the several pieces of the lining as the portions of the casing which extend between the sealing joints of adjacent pieces of the lining ensure that the mill as a whole is closed. The adjacent edges of the pieces of the lining are arranged to overlap one another in order to prevent the penetration of the material being ground to the softer material forming the outer casing, which would other-

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[Price 1/-]

Price 3/-

wise be deleteriously attacked by the material under treatment in the mill being thrown violently against it.

A number of frames so formed are tightly secured together by means of flanges or similar devices arranged thereon. In this manner, a casing is obtained which, interiorly, is provided with a complete wear-resisting face. If the mill casing is to be jacketed, the frames are shaped to form a hollow space between them and the inner lining of the casing, through which hollow space, water, air, or other fluid, may be circulated without entering the interior of the mill casing.

The formation of the inner lining of the casing in separate sections enables the same to be cast true and without strain in a solid uniform substance, and the lining of mill casings having complicated shapes may be effectively carried into practice. At the same time, however, the further advantage is attained that worn sections may be easily renewed.

In order that the invention may be clearly understood reference is directed to the accompanying drawing wherein:—

Figure 1 is a sectional elevation of a construction of mill casing constructed according to the invention, and

Figure 2 is a vertical section on the line 2—2 of Figure 1.

The example illustrated in the drawing is for a mill provided with a water cooling arrangement and consequently the frames which serve to hold the inner lining are closed exteriorly. Three frames, 1, 2 and 3 are provided, of which frame 1 serves to form the centre part of the mill, and frames 2 and 3 to form the covers. The frame 1 is subdivided into five panels, and is lined interiorly by means of five hard cast plates 4, 5, 6, 7 and 8.

The fixing of the parts 4—8 is effected by means of bolts manipulated from the outside of the frame, a packing being interposed between the lining and the said frame 1. The plate 4 is provided with a rib 9 to which is secured a forked bolt 10 by means of a pin 11. The bolt 10 extends through the wall 13 of the frame 1 and is tightened up from the outside by a nut 12, the tightening of which also effects the sealing. The plate 4 is thereby forced against ledges 14 extending around the frame 1. A packing cord 15 is provided to ensure an effective joint. A groove is preferably cut in the ledge 14 which serves to receive the packing cord and retain the same so that the mounting is easily effected. The packing cord may comprise any known form of packing material but it is preferable, however, to

employ a rubber cord as such will take up relatively large inequalities between the plate 4 and the ledge 14 and in this way uncleaned castings or slightly cleaned castings may be used. The use of rubber cord is, in the present case, unobjectionable as the cooling water is in contact therewith. In Figure 1 the plate 5 is omitted in order to clearly show the extent of the ledge 16 and the groove cut in the same for the packing cord.

The fixing of the remaining plates which form the inner lining is effected in a corresponding manner.

The cast pieces 6 and 7 form together in cross-section, a semi-circle and by this subdivision it is possible to separately pack each part easily on the frame 1, even when the parts 6 and 7 do not exactly fit. If a single piece is employed, the packing at the upper edges would cause difficulties, since then there is no pressure exerted perpendicularly on the packing. It is by the subdivision of the inner lining into a large number of separate parts that an easy and assured packing may be attained.

The plates 4—8 are lapped over each other stepwise at the abutting joints, so that particles of milled material cannot penetrate and possibly lead to the frame 1 being damaged.

The arrangement of the inner lining in the frames 2 and 3 takes place in a corresponding manner and no repetition of the description is needed.

It is of course, possible to dispense with the arrangement of a water cooling space at certain parts of the frame. Thus, for example, the plate 18 which is arranged in front of the pressure air inlet or exhaust outlet 17 of the frame 3 is fitted without a water cooling space. The fixing of the plates on the frames may take place in different ways, thus, for example, the plate 19 is provided with a boss in which is inserted when casting, a piece of soft iron 20. The soft iron inset is threaded and a bolt 21 is engaged therewith from the exterior.

It will be seen from the drawing that the inner lining which (see Figure 2) is formed from the parts 4—8 is interiorly directly in contact with the contents of the mill, while exteriorly the same is in direct contact with the cooling water. The casing wall may be heated instead of cooled in cases where this is desirable.

The frames 1—3, may, however, be so made that portions of the surface are removed, the fixing of the plate 8 being effected as shown in Figure 2. In this construction a bar 22 is only necessary as a support for the screw bolt 23. The plate 8 is, with this arrangement, able to radiate its heat directly outwards. If the casing

is made throughout in this manner, a satisfactory cooling is obtained, and in many cases water cooling may be dispensed with.

5 The frames 1, 2 and 3 are secured together by means of the flanges 24 and 25 and even with inexact production of the chilled cast plates forming the inner lining, a reliable and easily carried out  
10 packing of the whole mill casing is obtained.

The fixing of the plates forming the inner lining may, of course, take place in various ways. It is however, important  
15 that they are secured from the inside towards the frames. For in this way, a tight jointing of the separate panels and the protection of the frame against wear, is ensured, without the separate cast pieces  
20 needing to be sealed against each other.

The use of the improved casing is particularly advantageous with mills serving for grinding metal since with many of these the grinding process is favourably  
25 influenced by keeping the casing very cool.

The invention also presents advantages in cases where it is necessary to employ other particular materials than those above described for the  
30 inner lining of the casing, for example, where it is necessary to employ special materials which will not contaminate the substances undergoing treatment in the mill.

35 Having now particularly described and ascertained the nature of our said invention and in what manner the same is to

be performed, we declare that what we claim is:—

1. A mill casing for centrifugal dis- 40-  
integrating or cyclone mills, an inner lining of which is built up of elements of wear-resisting material, characterised in that the lining is secured to an outer frame or casing in such a manner as to 45-  
provide for the direct access of a cooling or heating medium to the outer surface of the lining, packing being provided between the lining elements and the outer frame or casing for the purpose specified. 50-

2. A mill casing as claimed in Claim 1, wherein the outer casing of the mill is closed and a hollow space is formed between the inner lining and the said outer casing for the purpose specified. 55-

3. A mill casing as claimed in Claim 1 or 2, wherein the elements of the inner lining are secured to the outer frame or casing by bolts, studs or the like arranged to extend through the outer frame or casing and which are operable to compress 60-  
the packing between the said elements and the outer frame or casing.

4. Improved mill casings constructed and arranged substantially as hereinbefore 65-  
described with reference to the accompanying drawings.

5. Mills provided with casings as claimed in any of the preceding Claims.

Dated this 16th day of July, 1930.

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Agents for the Applicants.

*[This Drawing is a reproduction of the Original on a reduced scale.]*

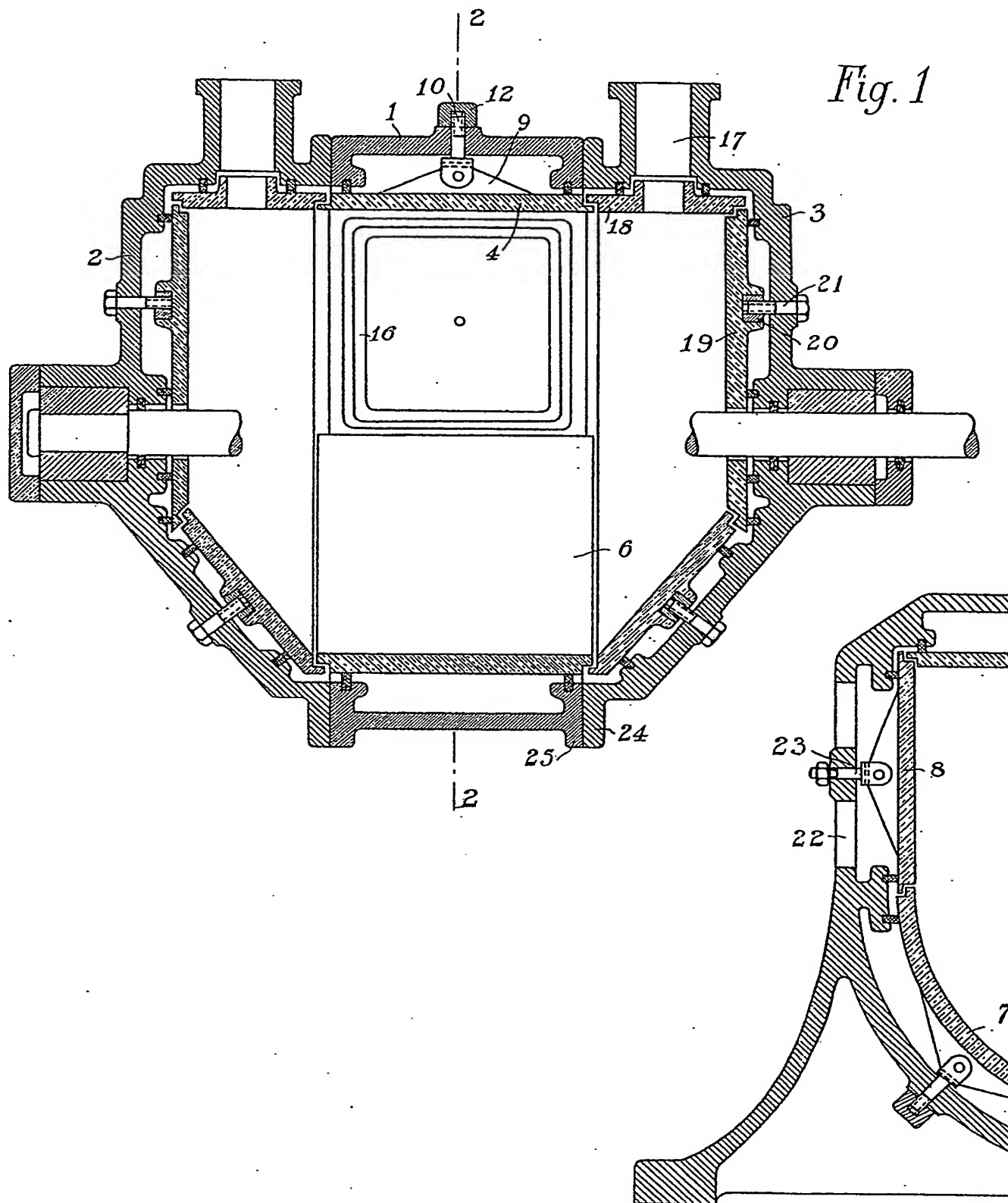


Fig. 1

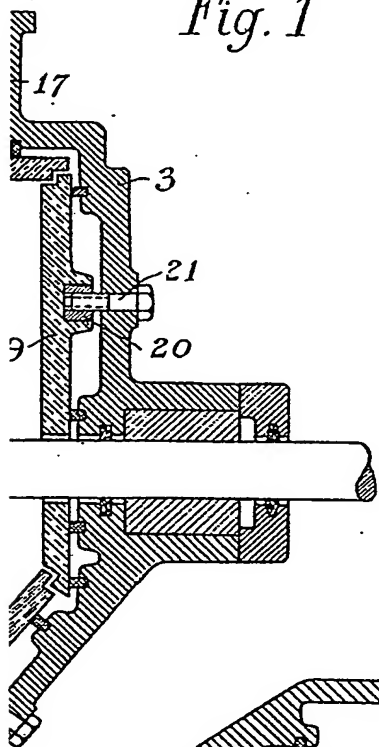
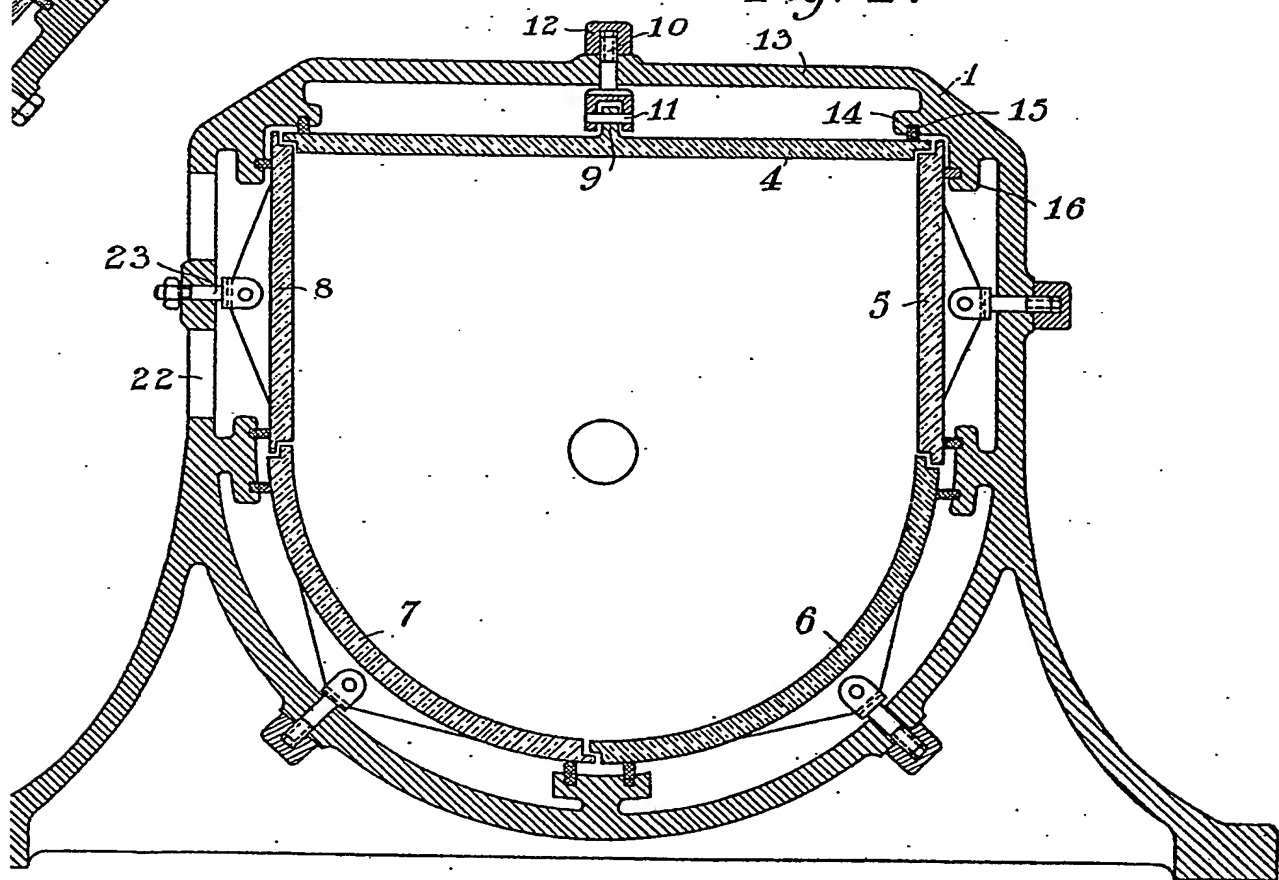


Fig. 2.



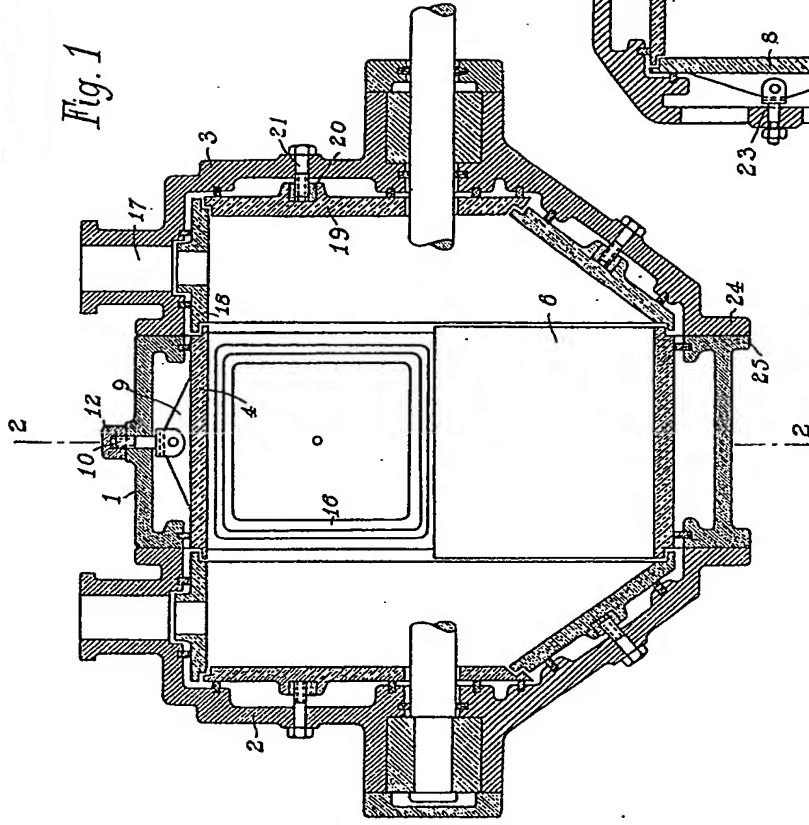
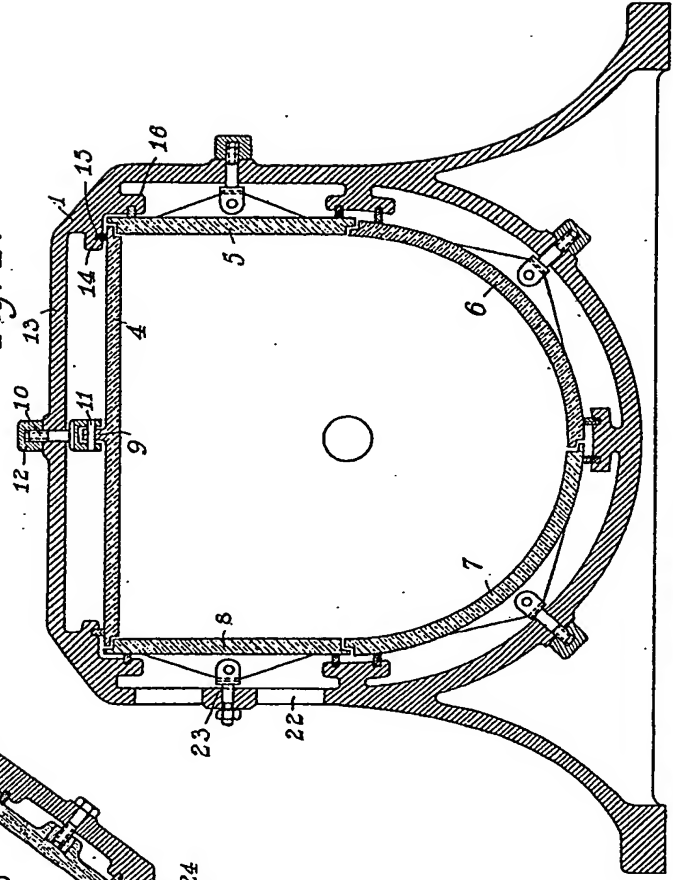


Fig. 1

Fig. 2.



[This Drawing is a reproduction of the Original on a reduced scale]